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EUROPEAN CORN BORER IN PENNSYLVANIA

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Corn Crop Destroyed by Corn Borers

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European Corn Borer in Pennsylvania

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The European corn borer (*Pyrausta nubilalis* Hubner) was first found in Pennsylvania in Girard Township, Erie County, in the Fall of 1919. This insect had been discovered in this country in 1917 near Boston, Massachusetts and in 1920 the Canadian authorities reported infestations in Welland and Elgin Counties, Ontario. The infestation at St. Thomas was heavy and it is thought that this might be the original point of infestation of the so-called western area.

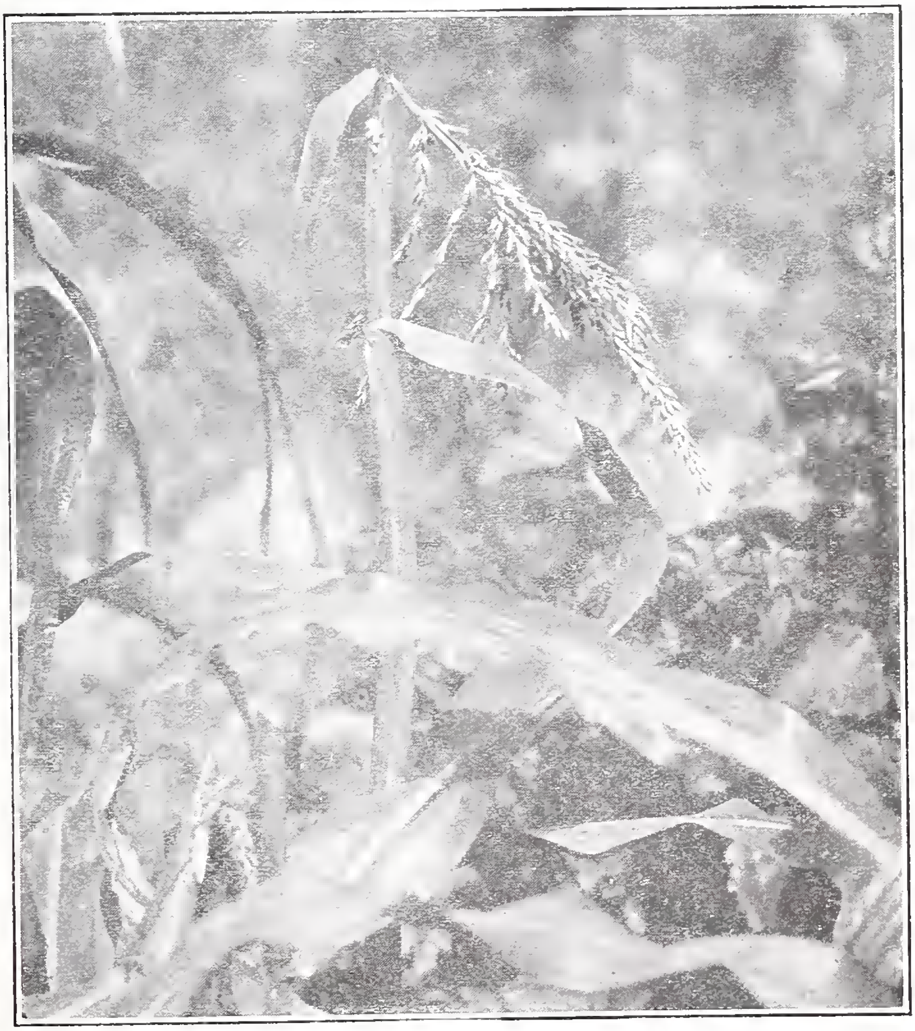

Fig. 1. Broken tassel due to corn borer feeding. Note Sawdust-like castings on stalk.

SPREAD IN PENNSYLVANIA

For a few years following the initial discovery, the spread of the borer was comparatively slow, and its numerical increase decidedly small. The relative yearly spread is as follows:

1919— 32 square miles in Erie County.
1920— 32 square miles in Erie County.
1921— 302 square miles in Erie County.
1922— 613 square miles in Erie and Crawford Counties.
1923— 653 square miles in Erie and Crawford Counties.
1924—1999 square miles in Erie, Crawford, Mercer and Warren Counties.

1925—The following Counties were added: Lawrence, Venango, Clarion, Forest, McKean, Elk, Cameron, Potter, and parts of Clinton, Jefferson, Armstrong and Butler Counties.

1926—The quarantine line extended between Washington and Greene Counties; Westmoreland and Fayette; Westmoreland and Somerset; Cambria and Bedford; Blair and Bedford; Blair and Huntingdon; Center and Mifflin; Clinton and Union; Lycoming and Northumberland; Lycoming and Montour; Lycoming and Columbia; Sullivan and Columbia; Sullivan and Wyoming; Bradford and Wyoming; Susquehanna and Lackawanna; and Susquehanna and Wayne.

1927—The line was pushed south to include Greene, Fayette, Somerset, and Bedford Counties excepting the townships bordering on West Virginia and Maryland. The area also included part of Huntingdon, all of Union County, parts of Northumberland, Montour, and Columbia, and all of Luzerne, Wyoming and Lackawanna Counties.

During the season of 1928, the Federal Department of Agriculture found the following additional townships to be infested: Kidder in Carbon County; Roaring Creek in Columbia County; Wayne in Greene County, Armagh, Brown, and Decatur in Mifflin County; Pocono in Monroe County; East Allen, Lower Mt. Bethel, Lower Nazareth, and Palmer in Northampton County; Lehman in Pike County, and Salem in Wayne County.

MANNER OF SPREAD

The European corn borer was likely brought into this country in broom corn. There was a shortage of this crop in this country about 1912, and large quantities were imported from Europe. A broom factory seemed to be the center of the infestation at St. Thomas, Ontario.

Locally, the insect spreads by the flight of the parent moth, and by the transportation of infested plants or parts of plants in which borers are feeding. Transportation of infested plants may be through the agency of man or by flood waters. The moths are rather strong flyers, marked individuals having been recovered at a distance of twenty miles over water and five miles over land.

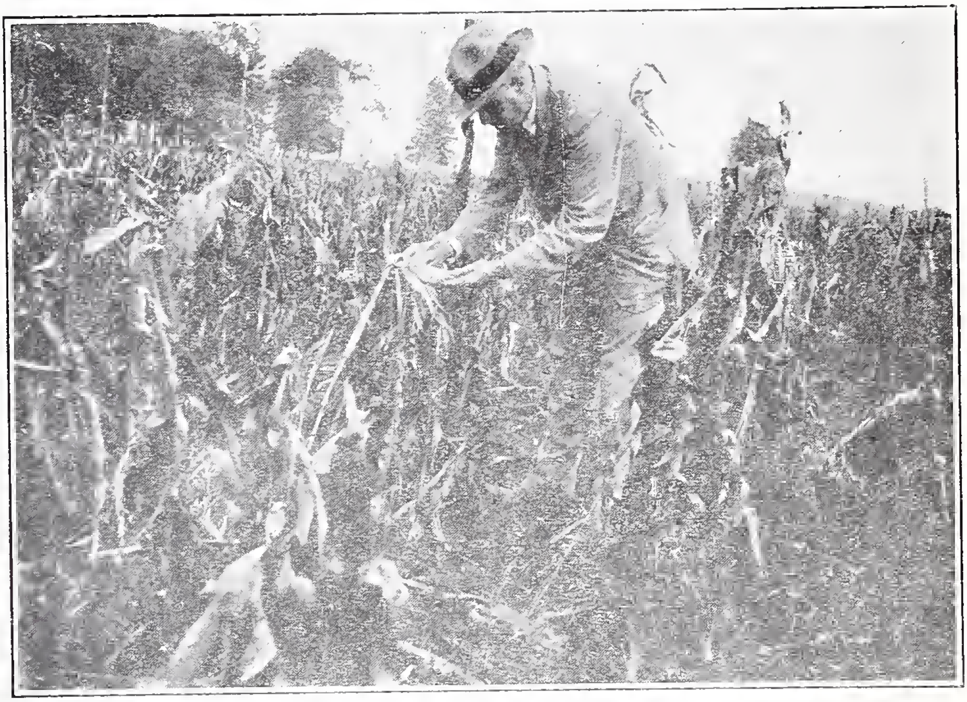

Fig. 2. A thirty-acre field destroyed by corn borers.

STAGES OF THE CORN BORER

In northern Pennsylvania, the moth stage of the corn borer appears about the second week in July and reaches the height of emergence soon thereafter, although some moths are found much later in the summer. The eggs are laid on the blades of corn, usually in clusters, varying from one-half dozen up to thirty-five or forty. These eggs soon hatch and the small borers or larvae begin feeding on the blades which are often riddled with small holes. The mid-rib is usually attacked next and later the stalk is penetrated near the tassel, and the first marked indication of the borer's presence is the breaking over of the tassel, and the appearance of the saw-dust like casting of the borer (See Fig. 1). After feeding in the upper part of the stalk, the borer begins to work down and may enter the ear and feed on the developing grain. However, much the greater damage is done to corn by the feeding of the larvae within the stalk. Where the insect is numerous the corn plant is so damaged that the grain does not mature beyond the milk stage and molds and rots usually render the crop unfit for use as feed for livestock. (See cover page and Fig. 2).

The borers complete their growth by fall, but do not leave the corn stalks in which they have fed until they appear as moths the following year. The inactive or pupal stage is attained about the middle of May, and with the appearance of moths, the second week in July, the yearly cycle is completed.

The life history as outlined is for the part of Pennsylvania known to be infested at the close of the season for 1927. The infestation which is appearing in the eastern part of the Commonwealth may or may not behave in the same manner, since the borers found in the so-called western area, that is, the area around Lake Erie, are known to have only a single generation in a year, while those found in the vicinity of Boston, Mass., are known to have two generations a year. At present, both the one and the two generation borers are reported as occurring in New Jersey. However, sufficient study has not been made of the infestation in the eastern part of this Commonwealth to determine which group of borers is represented.

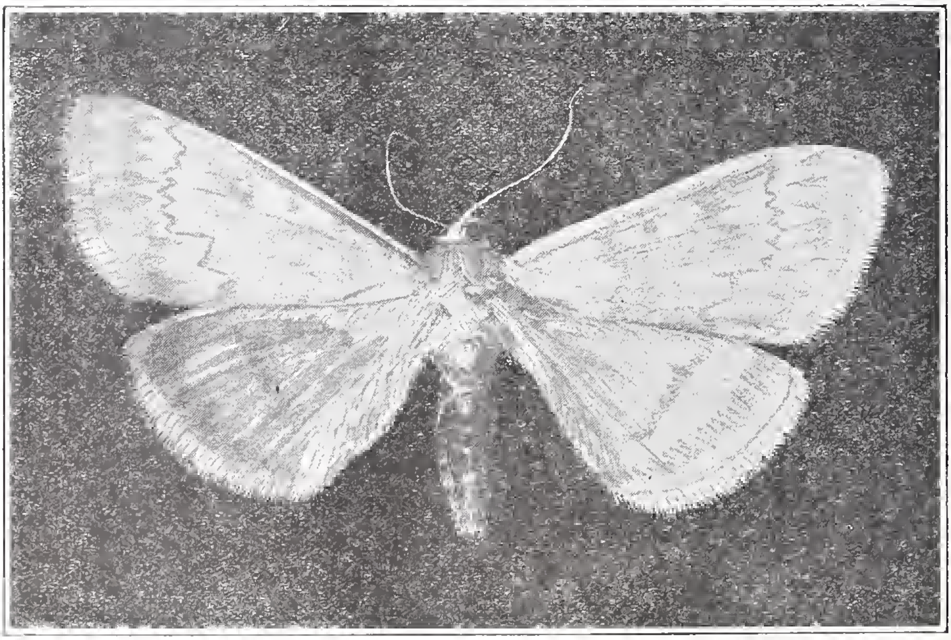

Fig. 3. **Adult (female) moth of European corn borer, enlarged.**

DESCRIPTION OF STAGES OF THE INSECT

The moths are about three-quarters of an inch long with a slender body and a wing expanse of from one to one and one-quarter inch. The females are rather cream colored with more or less of a brownish tint, and have three narrow wavy purplish brown bands across the wings. (See Fig. 3). The males are somewhat smaller than the females and darker in color.

The eggs are circular in shape, flat, glistening white, and in the cluster, overlap each other more or less like fish scales. As they mature the eggs become yellowish, and shortly before hatching the black heads of the little borers inside may be seen quite easily. When first hatched, the larvae are very small, being about one-sixteenth of an inch in length. They, however, grow rapidly, are about an inch in length when mature, smooth, pale, brownish white or dirty white, with occasionally a pinkish tint, the head being dark brown, and the body spotted with numerous brown dots. (See Plate 1, Fig. 3).

The pupal or resting stage of the insect is cigar-shaped, about three-quarters of an inch long, and varies in color from pale yellowish brown to dark reddish brown.

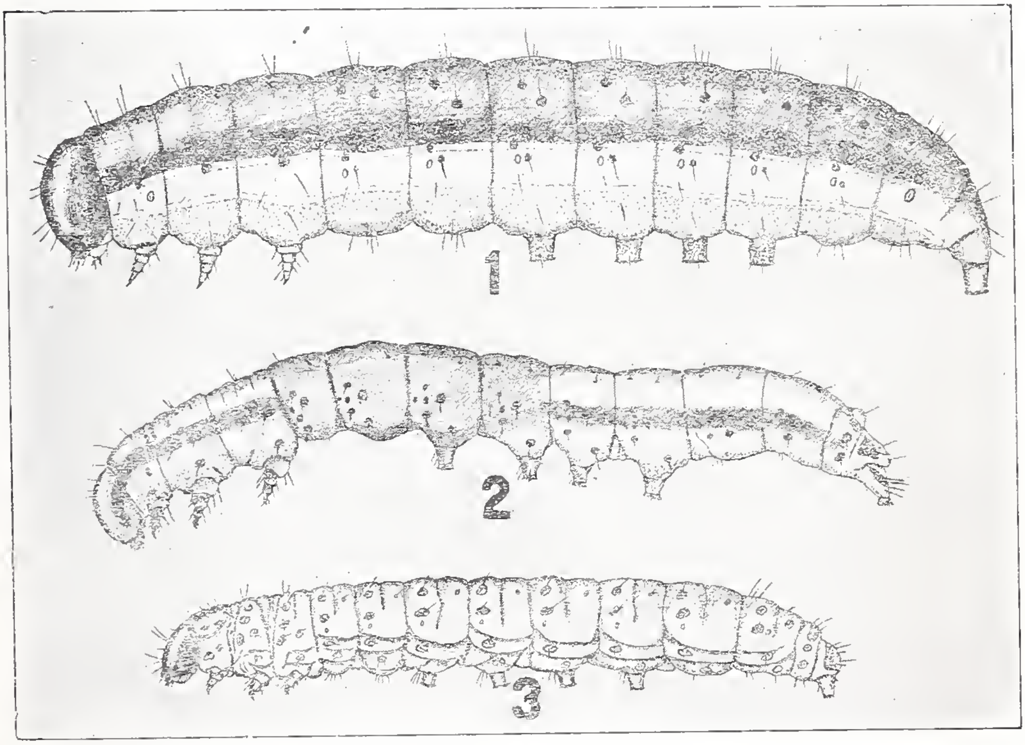

Plate I. European corn borer and larvae closely resembling it.
Fig. 1. Corn earworm. (Heliothis obsoleta Fab.):
Fig. 2. Stalk borer. (Papaipema nitela Guen.):
Fig. 3. European corn borer. (Pyrausta nubilalis Habner.)

CATERPILLARS LIKELY TO BE MISTAKEN FOR THE EUROPEAN CORN BORER

Among the caterpillars more or less commonly found in Pennsylvania are three which may easily be mistaken for the European corn borer. The most common of these (See plate I, Fig. 1), is the larvae of the corn ear worm (*Heliothis obsoleta* Fab.). The latter is about an inch and one-quarter or thereabouts in length, and varies in color from light green to dark brown with more or less indistinct stripes on the back, and a quite conspicuous pale colored band along the side. The head is yellowish brown in color. This caterpillar is a fairly common pest of corn, usually feeding on the kernals at the end of the ear and eating into the cob.

Perhaps the other species of caterpillar most apt to be mistaken for the European corn borer is the **stalk borer,** (*Papaipema nitela* Gn.). (See plate I, Fig. 2). This is a very common borer, especially in certain seasons, and may cause at times considerable injury in corn fields especially on the outer rows. The stalk borer is also a rather common pest of potatoes and tomatoes and certain weeds. The caterpillar of the stalk borer is distinguished from that of the European corn borer by having a conspicuous dark brown or purple band around the middle of the body and several conspicuous brown or purple stripes running lengthwise on the body. The larvae of the stalk borer habitually works within the growing tip or heart and stalk of young corn, but is never found in corn stalks during the winter.

The **smart weed borer** (*Pyrausta ainsliei* Heinrich), is frequently found in corn during the autumn, winter and spring, and in its work resembles that of the European corn borer so closely that it is often difficult to distinguish between them. The smart weed borer usually feeds within the stems of smart weed, but quite commonly bores into the stalk of corn and other plants for winter protection. The caterpillars are, when mature, about three-quarters of an inch long, slate colored or gray, and have a very fine faint line of dark color running along the middle of the back, this line being very much narrower and less conspicuous than in the case of the European corn borer. The final separation of this borer from the European corn borer is difficult and work for an expert.

CONTROL IN PENNSYLVANIA

Control in Pennsylvania is carried on in two ways: Enforcement of quarantine, and the enforcement of clean-up in the area of heavy infestation. These two ways will be discussed separately.

The Quarantine

1. By authority of the Act of the General Assembly, March 1927, the European corn borer is declared a public nuisance and a quarantine established.

2. The quarantine prohibits the movement of corn, broom corn, (including all parts), all sorghums and sudan grass from points inside the quarantined area to any points outside the quarantined area.

3. Any of the enumerated plants or plant products may be moved freely from any point inside the quarantined district to another point inside the quarantined district.

4. The movement of plants and plant products subject to this quarantine is in no way restricted in territory outside the quarantined area.

5. Plants and plant products subject to restriction and originating outside of the quarantined area may be moved freely to any point in the quarantined area.

6. Areas of enforced clean up are established by the Secretary of Agriculture and in these areas all remnants of the corn crop, exclusive of the grain either shelled or on the cob, must be destroyed by burning or by completely plowing under before May 1 of the year following the growing of the corn. Shredded corn stover, corn stubble not higher than two inches, and corn stalks well tramped into manure are exempt from these requirements.

Those desiring information relative to the area of enforced clean up should write this department since conditions change from year to year because of the constant spread of the borer.

7. Corn on land subject to overflow in certain districts established by the Secretary of Agriculture must be removed from such land to land which is above the high water mark of such streams before the first of December of each year.

8. The plants enumerated in this quarantine and their waste products may not at any time be lawfully dumped or allowed to be dumped into any creek, river, or other stream, or body of water at any time throughout the year.

It may not always be evident why it is thought proper to make such restrictions as are imposed in this and other plant quarantines. The main object of the plant quarantins is to prevent long distance spread of the insect through the agency of man. The movement of roasting ears is one of the leading ways in which the corn borer might be carried from place to place. It is, also, evident that the movement of corn stalks at any season of the year from the area of infestation to points outside would likewise constitute a favorable method for the spread of the insect. It was for the prevention of such spread that the quarantine with its various regulations was established.

Clean Up of Corn Remnants

The control of the corn borer is largely a matter of farm practice. Any operation which will destroy the borer in the corn fodder or stover before the time of the emergence of the moth constitutes a satisfactory control method. Low cutting and the shredding of the corn fodder for the silo is as satisfactory a control as is known. If the corn fodder is not shredded and is fed in its entirety, the stalks must be disposed of in one of the following ways:

1. **Completely plowed under to a depth of six inches.**

2. **Completely tramped into manure as would take place in a covered barnyard, or**

3. **Gathered and burned.**

In any case these stalks must be disposed of before May first.

Corn should be cut not higher than two inches, and when the corn stubble is higher than this, it should be destroyed by breaking over and completely plowing under, or broken off, gathered and burned. Such high stubble must be disposed of before May first.

All other corn refuse whether it be stubble, unused stover, loose corn stalks, corn cobs not having grain attached thereto, and corn remnants of any kind about the buildings, barnyard, feeding lots or pasture fields should also be so disposed of.

Coarse stemmed and pithy weeds growing in and near corn fields may also serve as over winter quarters for the borer and should be treated the same as the corn refuses.

Corn stalks in manure should be thoroughly tramped by livestock before it is safe to assume that they contain no living corn borers.

These clean-up methods have been used in the heavily infested counties of Pennsylvania for the past seasons, and have greatly reduced the borer population. Reports, also, from the heavily infested areas in Canada where the corn borer showed an ability to completely destroy corn crops give a very decided decrease in the borers following a successful clean-up season. These decreases were so much that the corn acreage, which had been greatly reduced beause of the borer, has been increased in the area the past year. The clean-up methods to be successful must be carried on throughout the whole community.

WORK OF OTHER AGENCIES

Many agencies are at work making extensive studies of the corn borer. The Federal Department of Agriculture has established laboratories in Massachusetts, New York, Ohio and Michigan where the behavior of the borer is very carefully studied, and where an effort is being made to develop varieties of corn which will withstand the attack of the borer. Study is also in progress relative to the date of planting in relation to the borer population. Much of promise has come from these investigations and it seems likely that from these and the State research stations will come much help in the solution of the borer problem. The Federal government also maintains men in foreign counties where complete studies are made of natural enemies which tend to keep the borer under control. Several of these natural enemies (parasites) have been introduced into this country.

The work has been carried on not alone in the United States. The Canadian government has done much along the line of research. The workers of both countries cooperate on the project, and the findings of one is the common property of both.

Great development has also taken place in the matter of the adaptation of farm machinery to the control of the borer. This includes the development of low cutting devices, husking and shredding attachments, and plows designed for the complete turning under of corn refuse.

It is quite evident that the corn borer will be with us always and that the American farmer must learn to grow corn in spite of the borer.

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